

INSTRUCTION MANUAL

SPRING BALANCER

ELF-3

ELF-5

ELF-9

Distributed by Ergonomic Partners Sales@ErgonomicPartners.com www.ErgonomicPartners.com
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A WARNING

- Read this manual before use.
- Keep this manual available.

遠藤工業株式会社 ENDO KOGYO CO.,LTD.

ENDO:

BM-10066

SAFETY ALERT SYMBOL AND ALERT SIGNS

Please read this manual carefully and follow its instructions.

The SAFETY ALERT SYMBOL (), WARNING, CAUTION, and NOTE carry special messages.



This SAFETY ALERT SYMBOL is used to call your attention to items or operations that could be dangerous to you or other persons using this equipment.

Please read these messages and follow these instructions carefully.



WARNING • WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury, damage or destruction of the equipment and others.

NOTE: NOTE indicates a special instructions in operation or maintenance.

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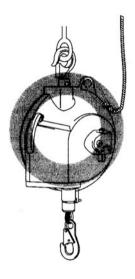
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1. A Safety instructions

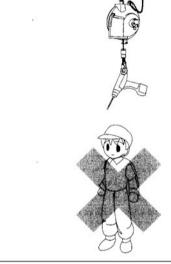
A

WARNING

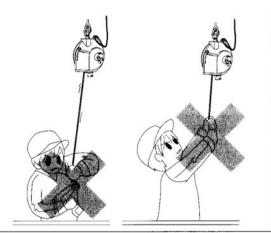
- •Incorrect use of the spring balancer could cause personal injury.
- Observe instructions in the manual and use the balancer correctly.
- Install the balancer correctly.
- Always attach a secondary support cable or chain.



Never stand under the suspended tool/device.



- Never remove tool/device while the wire rope is extended.
- Never pull the wire rope when unloaded.
- Never release the drum lock when unloaded.



Be careful when handling the spring.



- Never alter the balancer.
- Periodically inspect the balancer.

2. Description of product

2-1. Specifications

Model	Capacity range (kg)	Factory Preset Capacity (kg)	Cable travel (m)	Mass (kg)
ELF-3	1.5~3.0	2.3	2.5	Approx. 4.6
ELF-5	3.0~5.0	4.0	2.5	Approx. 4.8
ELF-9	5.0~9.0	7.0	2.5	Approx. 5.4

■Working conditions Application area :Indoor and normal atmospheric conditions

Temperature range:-10℃ to +50℃

2-2. Main features

Fall prevention device

A mechanism to prevent the suspended tool/device from falling to the maximum cable travel in case of spring breakage.

This mechanism can not prevent the tool/device from falling at all when the spring breaks.

■Drum lock (See Chapter 4-2 "Drum lock operation")

A mechanism to lock the drum every 1/5 turns.

This mechanism is used when removing the suspended tool/device (See Chapter 4-3) or replacing the wire rope (See Chapter 7).

3. Installation

3-1. Balancer installation



WARNING

■Install the balancer correctly.

Incorrect installation could cause personal injury or damage to the balancer or other equipment.

•Always attach a secondary support cable or chain.

It is required to protect worker (s) in case of failure of the top hook or the fitting.

1) Prepare a fitting that can support at least 2kN {200kgf}. NOTE: The fitting must have no opening as shown in

Fig. 1 to prevent the balancer from disengaging when it swings.

2) Attach the top hook of the balancer directly to the fitting.

Check the latch is closed.

NOTE: Take care the balancer does not hit surrounding objects. Make the mounting height different for each balancer to avoid collision.

3) Check the top hook can swivel freely.

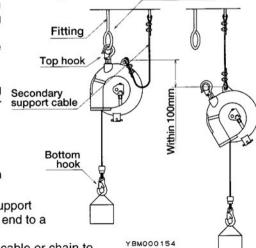
NOTE: Do not fasten the top hook to the balancer body.

4) Prepare a secondary support cable or chain, used in the balancer, that can support at least 2kN {200kgf}.

5) As shown in Fig. 1, attach an end of the secondary support cable or chain to balancer body, and attach the other end to a separate fitting which does not support the balancer.

NOTE: Leave some slack in the secondary support cable or chain to allow the balancer to rotate freely.

The slack must be a suitable length so that the balancer will stop within 100mm when falling in case of failure of the top hook or the fitting (See Fig. 1).



No opening

Fig. 1



WARNING

Never pull the wire rope when unloaded.

If the wire rope is released when extended with no load, it will snap back and could cause personal injury.



CAUTION

If the spring tension is set over the maximum capacity, the balancer can not provide the specified cable travel and the spring life will be shortened.

If the spring tension is set under the minimum capacity, the fall prevention device will operate and stop the suspended tool device.

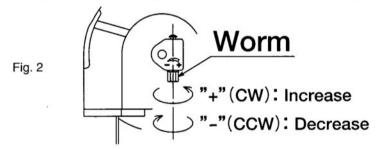
- 1) Before attaching, check the mass (weight) of the complete tool/device, including all accessories, is within the capacity range of the balancer.
- 2) Lift the complete tool/device up to the bottom hook and attach it.

Never pull the wire rope down to the tool/device.

NOTE: The suspended tool/device will drop down if the spring tension is not enough. Lower the tool/device slowly by hand.

- 3) Adjust the spring tension by turning the worm with a wrench, etc. Turn to the "+" side (clockwise) for increasing the spring tension, turn to the "-" side (counterclockwise) for decreasing (See Fig. 2).
- 4) Check the tool/device balanced.

NOTE: Over-tensioning could cause damage to the balancer body or the wire rope.



YBM000155

3-3. Working stroke (cable travel) check



CAUTION

Extending the wire rope past the maximum cable travel could cause damage to the balancer.

- 1) Check the cable travel is long enough for the application.
- 2) If necessary, lower the mounting height of the balancer or insert a suitable fitting between the bottom hook and tool/device.

4. Use

4-1. Safety instructions on use



WARNING

- Never remove tool/device from the bottom hook while the wire rope is extended.
- Never stand under the suspended tool/device.
- Never alter the balancer.

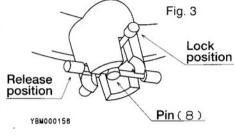


CAUTION

- •Always use within the capacity range of the balancer.
- Always adjust the spring tension before use.
- Do not extend the wire rope past the maximum cable travel.
- Do not pull the wire rope at an angle.

4-2. Drum lock operation

- 1) Pull Pin (8) Up and turn it clockwise to place in the lock position (See Fig. 3).
- Move the suspended tool/device upward or downward until Pin (8) enters the slot/hole in the drum and the drum becomes locked.
- Move the tool/device again to check the drum is locked securely.
- 4) Remove the tool/device from the bottom hook.





WARNING

Never remove the suspended tool/device before checking the drum is locked securely. If the drum is not locked securely, the drum lock could be released allowing the wire rope to snap back, possibly causing personal injury.

- 5) Before releasing the drum lock, attach a new tool/device if the old one has been removed. The new tool/device must have almost the same mass (weight) as the old one.
- Release the drum lock by pulling Pin (8) up.
 Turn Pin (8) clockwise and place it in the release position.



WARNING

Never release the drum lock when the balancer is unloaded or the new tool/device has a different mass (weight) to the old one.

If released, the wire rope will snap back or the tool/device could drop down respectively, possibly causing personal injury. Always release the drum lock after arranging the tension of spring and tool/device. This is important factor for safety.

4-3. Tool/device replacement

- Method 1-With drum lock.
- 1) Lock the drum according to Chapter 4-2 "Drum lock operation" Remove the suspended tool/device.



WARNING

Move the tool/device upward and downward to check the drum is locked securely.

Never remove the tool/device before checking this.

If the drum is not locked securely, the drum lock could be released allowing the wire rope to snap back, possibly causing personal injury.

- Before attaching, check the mass (weight) of the new complete tool/device, including all accessories. is within the capacity range of the balancer.
- 3) Attach the new complete tool/device to the bottom hook.
- 4) After relesing the drum lock, adjust the spring tension again and check the tool/device is balanced.

NOTE: Over-tensioning could cause damage to the balancer body or the wire rope.



WARNING

- Never release the drum lock when the balancer is unloaded. If released, the wire rope will snap back, possibly causing personal injury.
- ●Always hold the suspended new tool/device by hand when releasing the drum lock, if the new tool/device has a different mass (weight) to the old one. Otherwise, the tool/device could rise up or drop down suddenly, possibly causing personal injury.
- ■Method 2-Without drum lock



WARNING

Never remove the suspended tool/device while the wire rope is extended. If removed, the wire rope will snap back and could cause personal injury.

- 1) Lift then remove the suspended tool/device when the wire rope is fully retracted.
- 2) Attach a new tool/device according to Chapter 3-2 "Tool/device attachment and spring tension adjustment".
- Troubleshooting



WARNING

- If a malfunction occurs during operation, stop operation immediately and take the necessary steps to rectify the problem.
- ●Never remove the suspended tool/device before identifying causes of the malfunction. If removed, the wire rope will snap back and could cause personal injury.

5-1. Common malfunctions and their causes

Malfunction	Cause	Solution		
Wire rope can not be pulled out and retracted.	 Drum lock is engaged. Wire rope has slipped off from the drum groove and is caught between drum and casing. Spring has broken. 	●Release drum lock. See Chapter 4-2. ●Return wire rope to the drum groove. See Chapter 5-2. ●Replace spring. See Chapter 8.		
Wire rope can not be pulled out.	 Spring is fully wound up because of over-tensioning. Fall prevention device is engaged because the spring tension is set under the minimum capacity. 	See Chapter 3-2. ●Release fall		

Contact your dealer or us if a malfunction not listed above occurs.

5-2. Solutions (Refer to the disassembly drawings on pages 21)



CAUTION

Careless repairs can cause personal injury or damage to the balancer. Therefore, be careful but thorough when making repairs.

- ■When the wire rope is caught between drum and casing.
- 1) Release Wire rope by jerking it strongly while the tool/device is suspended. NOTE: After jerking, check wire rope and replace if damaged.

- 2) If Wire rope cannot be released by jerking, disassembly is required. Remove Retaining ring (43) from Worm (42).
- 3) Remove Retaining ring (43) from Worm (42).

 Release all spring tension by turning Worm (42) to the "-" side (counterclockwise) until Worm

NOTE: Check the spring tension by pulling Wire rope.

- 4) Remove the tool/device from bottom Hook (30), and remove the balancer from the fitting.
- 5) Loosen Screws (41) and remove Cover (40).
- 6) Return Wire rope (28) to the groove of Drum (16).

NOTE: Check Wire rope and replace if damaged.

7) Install Cover (40).

can almost be removed.

- 8) Install Worm (42), and attach Retaining ring (43).
- 9) Wind Spring (18) by turning Worm (42) to the "+" side (clockwise) .

CAUTION: While turning Worm, Wire rope (28) will be retracted into Drum (16).

Pay attention Wire rope does not slip out from the drum groove.

After Wire rope is fully retracted, turn Worm by the number of turns shown in Table 1 of 「Spring replacement」.

■When the fall prevention device has engaged because the spring tension is set under the minimum capacity.

While suspending the tool/device, turn Worm (42) to the "+" side (clockwise) to increase the spring tension until the fall prevention device disengages.



WARNING

Never remove the suspended tool/device.

If removed, the wire rope will snap back the moment the fall prevention device disengages and could cause personal injury.

6. Inspections



WARNING

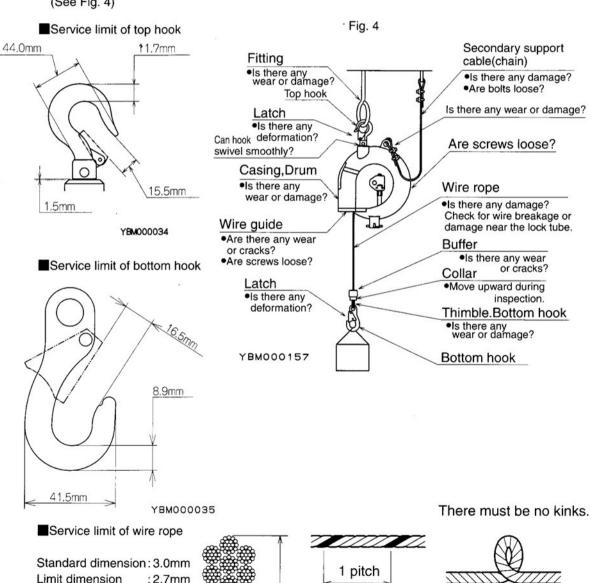
Periodically inspect the balancer, and replace any Worm or damaged parts.



CAUTION

Always use genuine parts for replacement.

■Inspect the balancer at least once a month.
 Correct and repair any problems which are detected.
 Make the inspection interval shorter when operating frequently or under hostile environments.
 (See Fig. 4)



Allowable number of broken wires in 1 pitch is 11

7. Wire rope replacement

- Lower the tool/device, extending Wire rope to the maximum cable travel.
- Position Screw (39) at the casing opening as shown in Fig.5, and engage the drum lock.
 See. Chapter 4-2 "Drum lock operation".
- Move the tool/device upward and downward to check Drum is locked securely. Remove the tool/device from bottom Hook.

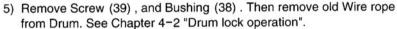


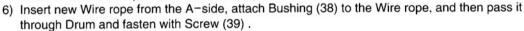
WARNING

Never remove the suspended tool/device before checking Drum is locked securely.

If Drum is not locked securely, the Drum is not lock could be released allowing Wire rope to snap back or Drum to rotate suddenly, possibly causing personal injury.

4) Remove the balancer from the fitting and place on the floor.





7) Install the balancer on the fitting. See Chapter 3-1 "Balancer installation".

8) Attach the tool/device to bottom Hook, and release the drum lock.



WARNING

Never release the drum lock before attaching the tool/device.

If released, Wire rope will snap back and could cause personal injury.

8. Spring replacement

Never remove the spring from the drum unless the replacement is required. Replace O-ring and the spring at the same time.



WARNING

The spring is extremely dangerous. Be careful when handling the spring.

•Never pull the center of the spring when removing the spring from the drum. If pulled, the spring will expand explosively and cause personal injury.

Referring to the disassembly drawing (on pages 21), replace the spring using the following procedure.

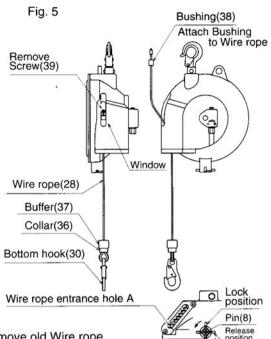
A.When the spring has broken;

Remove the tool/device from bottom Hook (30).

B.When the spring has not broken;
Lift then remove the tool/device from bottom hook (30) when Wire rope (28) is fully retracted into Drum (16).

2) Remove the balancer from the fitting and place on the floor.

3) Remove Retaining ring (43) from Worm(42). Release all spring tension by turning Worm (42) to the "-" side (counterclockwise) until Worm can almost be removed. NOTE: Check the spring tension by pulling Wire rope.



- 4) Turn Worm (42) further and remove it.
- 5) Remove Screw (39), Bushing (38) and the Wire rope (28) from Drum (16).
- 6) Loosen Screws (41) and remove Cover (40) .
- 7) Remove Drum (16) and Spindle (14) together from Casing (1). The remove Spindle (14) from Drum (16).
- 8) Loosen Screws (26) and remove Cover (20) from Drum (16) .
- 9) Check where is the broken portion of spring (18). Check that the rivet of Spring is not broken.

If Spring is broken near the outer periphery where is no space between each turn or the rivet of Spring (18) is broken (See Fig.6), stop the replacement work. Reassemble Cover (20)

and contact the dealer.

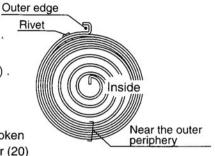


Fig. 6

Check Stopper (23) and Rivet (24) when spring breakage. Replace them if they are broken.



WARNING

Never remove spring from the Drum when spring is broken near the outer periphery or the rivet of Spring is broken (See Fig. 6) .

If removed, the spring will expand explosively and cause personal injury.

- 10) Remove Spindle (14) from Drum (16) and remove Spring (18).
- 11) Remove O-ring (15) from Spindle (14).
- 12) Reassemble in reverse order.
 - First install Spindle (14) in Casing (1), then lubricate O-ring (15) with grease. And lubricate Spring with grease.
 - ●When installing Cover (20) to Drum (16), place Stopper(23) in outer edge of Spring (18). (See Fig. 7) Cheek Stopper can move smoothly after installing.
- 13) Wind Spring (18) by turning Worm (42) to the "+" side (clockwise).

NOTE: While turning Worm, Wire rope (28) will be retracted into Drum (16). Pay attention Wire rope does not slip out from the drum groove. After Wire rope is fully retracted, turn Worm by the number of turns shown in Table 1.

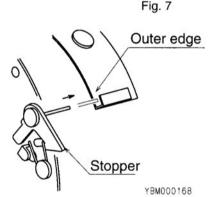


Table 1

Model	ELF-3	ELF-5	ELF – 9 Approx. 85	
Number of turns	Approx. 90	Approx. 90		
Number above are for the middle value of the capacity range.	2.3kg	4.0kg	7.0kg	

9. Spring disposal



WARNING

The spring is dangerous due to remaining tension even if it is broken.

Give a warning to disposal companies that the spring will expand explosively and cause danger if the spring is treated roughly or the center of the spring is pulled.

10. Wire guide replacement

- 1) Pull out the wire rope to the position which wire guide replacement is available and lock drum with drum lock device (refer to Fig. 8)

 Refer to Chapter 4–2 "Drum lock operation".

 Wire guide (44), (45)

 Hex. socket b
- After confirming that drum lock is surely on work, moving a suspended tool up and down, take off a suspended tool.

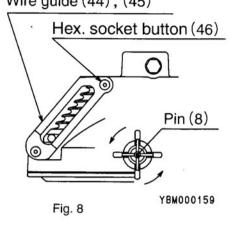


WARNING

Never remove the suspended tool/device before checking Drum is locked securely.

If Drum is not locked securely, the drum lock could be released allowing Wire rope to snap or Drum to rotate suddenly,

possibly causing personal injury.



- 3) Remove the balancer from a fitting and place on the floor.
- 4) Remove Hex. Socket button bolts (46) are old wire guide from casing.
- 5) Fix new wire guide (44), (45).

NOTE: Hex. Socket button bolts (46) are sealed against looseness.

Always replace old ones with new ones when they are removed.

Tighten the hex. Socket bolts with torque of 2.8~3.0N·m {0.28~0.3kgf·m}.

- Mount the balancer on a fitting.
 Reter to Chapter 3–1 "Balancer Installation".
- 7) Attach the tool/device to bottom Hook, and release the drum lock.

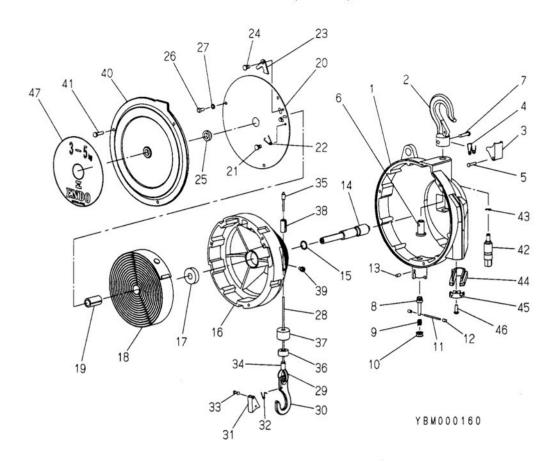


WARNING

Never release the drum lock before attaching the tool/device. If released, Wire rope will snap back and could cause personal injury.

PARTS LIST

ELF-3, ELF-5, ELF-9



照合番号	部品番号	部品名称		t∕Qua		Description
Ref. No.	Part No.	10111111111111111111111111111111111111	ELF-3	ELF-3 ELF-5 ELF-9		Description
* <u>-</u> *	LBP001317	ケース部1式	1	1	1	Casing assembly
1	P2B100141a	ーケース	1	1	• 1	-Casing
-	LBP000262	- フック1式	1	1	1	-Hook complete
2	-	ーーフック	1	1	1	Hook
-	LBP000263	外レ止メ1式	1	1	1	Latch set
3	_	外レ止メ	1	1	1	Latch
4		スプリング	1	1	1	Spring
5	_	丸リベット	1	1	1	Rivet
6	_	ーーシャフト	1	1	1	Shaft
7	_	丸リベット	1	1	1	Rivet
-	LBP001318	ドラムロック部1式	1	1	1	Drum lock assembly
8	_	- ピン	1	1	1	-Pin
9		-スプリング	1	1	1	-Spring
10	(- カラー	1	1	1	-Collar
11	_	- スプリングピン	1	1	1	-Spring pin
12	P2B400359a	キャップ	2	2	2	Cap
13	P2B400041a	六角穴付止ネジ	1	1	1	Set screw
14	P2B300957a	スピンドル	1	1	1	Spindle
15	P2B401573	Oリング	1	1	1	O-ring
16	P2B100140b	ドラム	1	1	1	Drum

照合番号	部品番号	部品名称	個数/Quantity		ntity	Description
Ref. No. Part No.		A - 1/2/2017	ELF-3ELF-5ELF-9			Description
17	KA60104010	ボールベアリング	1	1	1	Ball bearing
18	P2B300950a	スプリング	1	-	-	Spring
18	P2B300951a	スプリング	-	1.	-	Spring
18	P2B300952a	スプリング	-		1	Spring
19	P2B401584	ブッシュ	1	1	1	Bushing
_	LBP001299a	ディスク1式	1	1	1	Disc assembly
20		- カバー	1	1	1	-Cover
21	_	- リベット	1	1	1	-Rivet
22	_	- スプリング	1	1	1	-Spring
23	_	ーストッパ	1	1	1	-Stopper
24	· –	-リベット	1	1	1	-Rivet
25	P2B401579	ブッシュ	1	1	1	Bushing
26	KA10120512	十字穴付ナベ小ネジ	3	3	3	Screw
27	KA31120500	バネ座金	3.	3	3	Spring washer
_	LBP001300	ワイヤロープ1式	1	1	1	Wire rope assembly
28	_	- ワイヤロープ	1	1	1	-Wire rope
29	<u> </u>	ーシンブル	1	1	1	-Thimble
-	LBP000021	- フック1式	1	1	1	-Hook complete
30	_	ーーフック	1	1	1	Hook
_	LBP000270	外レ止メ1式	1	1	1	Latch set
31	_	外レ止メ	1	1	1	Latch
32	_	ーーースプリング	1	1	1	Spring
33	_	丸リベット	1	1	1	Rivet
34		- ロック管	1	1	1	-Lock tube
35	_	- ロック管	1	1	1	-Lock tube
36	P2B400149a	- カラー	1	1	1	-Collar
37	P2B400146	- 緩衝ゴム	1	1	1	-Buffer
38	P2B401575a	ブッシュ	1	1	1	Bushing
39	P2B401619	座金組込ミ六角穴付ボルト	1	1	1	Screw
40	P2B200190a	カバー	1	1	1	Cover
41	P2B400860	座金組込ミ十字穴付ナベ小ネジ	3	3	3	Screw
42	P2B300062b	ウォーム	1	1	1	Worm
43	KA40310050	E形止メ輪	1	1	1	Retaining ring
-	LBP001021	ワイヤガイド1式	1	1	1	Wire guide set
44	_	- ワイヤガイド	1	1	1	-Wire guide
45	_	- ワイヤガイド	1	1	1	-Wire guide
46	P2B401213b	- 六角穴付ボタンボルト	2	2	2	-Hex.socket button bolt
47	P2B300954a	ネームプレート	1	_		Name plate
47	P2B300955a	ネームプレート	-	1	_	Name plate
47	P2B300956a	ネームプレート	-		1	Name plate
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NOTE) When placing an order, clearly specity the product model, part number and description. Parts without a part number cannot be supplied individually. Please purchase a set or complete unit.

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